IN THE CLAIMS

1. (Previously Presented) A noise shaping arrangement for a phase locked loop, the arrangement comprising:

a first order sigma-delta modulator arranged to provide a first-order quantized output and a feedback path output;

a second order sigma-delta modulator coupled to receive the feedback path output from the first order sigma-delta modulator and arranged to provide a second order quantized output; and

combination means arranged to combine the first and second order quantized outputs to provide a combined third order quantized output, wherein the combined third order output provides noise shaping with a frequency notch spectrum.

2. (Previously Presented) The arrangement of claim 1 wherein the second order sigma-delta modulator is arranged with one or more complex conjugate pairs of zeros.

3. (Previously Presented) The arrangement of claim 2 wherein the one or more complex conjugate pairs of zeroes is located on the unity circle.

4. (Previously Presented) The arrangement of claim 2 wherein the one or more complex conjugate pairs of zeroes is located away from the real axis.

5. -16 (Canceled)

17. (New) The arrangement of claim 4 wherein the frequency location of the one or more complex pair of zeros is a selected one of substantially 365kHz and substantially 518kHz.

18. (New) The arrangement of any preceding claim where the feedback path output of the first order sigma-delta modulator received by the second order sigma-delta

modulator is scaled by a factor of substantially one quarter and wherein accumulators of the first order and second order sigma-delta modulator respectively have the same bit-size.

19. (New) The arrangement of claim 1, further comprising a delay block coupled between the feedback output of the first order sigma-delta modulator and the combination means.

20. (New) The arrangement of claim 1 wherein the combination means includes scaling means coupled to scale the second order quantized output of the second order sigma-delta modulator by a predetermined scaling factor.

21. (New) The arrangement of claim 20 wherein the predetermined scaling factor is substantially 2^{-22}.

22. (New) The arrangement of claim 1, wherein the second order sigma-delta modulator is operable to cancel the quantisation noise of the first order sigma-delta modulator.

23. (New) The arrangement of claim 1 wherein the feedback path output comprises a quantisation noise of the first order sigma-delta modulator.

24. (New) The arrangement of claim 1 wherein the frequency notch spectrum comprises at least one non-DC frequency notch.

25. (New) The arrangement of claim 1 wherein the second order sigma-delta modulator comprises a loop arrangement having a forward processing block implementing the transfer function given by the z-transform:

$$\frac{z^{-1}}{1-2z^{-1}\cos\theta+z^{-2}}$$

and a feedback processing block implementing the function given by the z-transform:

$$2\cos\theta - z^{-1}$$

where

$$\theta = 2\pi \frac{f}{f_s}$$

and f is the desired notch frequency and f_s is the sample frequency.

26. (New) A phase locked loop incorporating the noise shaping arrangement of claim 1.

27. (New) A method for noise shaping in a phase-locked loop, the method comprising the steps of:

providing a first order quantized output from a first order sigma-delta modulator;

providing a second order quantized output from a second order sigma-delta modulator coupled to receive a feedback path output from the first sigma-delta modulator;

combining the first and the second order quantized outputs to provide a combined third order quantized output, wherein the combined third order output provides noise shaping with a frequency notch spectrum.

28. (New) The method of claim 27 wherein the phase locked loop is a fractional-n phase locked loop frequency synthesizer.